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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/035,766

12/26/2001

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08/23/2004

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EXAMINER

GUHARAY, KARABI

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 08/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

2

<b>Office Action Summary</b>	<b>Application No.</b> 10/035,766	<b>Applicant(s)</b> SCHUELLER ET AL.	
	<b>Examiner</b> Karabi Guharay	<b>Art Unit</b> 2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 May 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 15-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>09/03 &amp; 04/02</u> . | 6) <input type="checkbox"/> Other: _____  |

***Election/Restrictions***

Applicant's election of Group I, including claims 1-14, in the reply, filed on 04 May 2004, is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 15-24 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II, there being no allowable generic or linking claim.

***Specification***

The disclosure is objected to because of the following informalities: On page 7, in the paragraphs [0035] & [0036], first etch layer is designated by # 31, however, it should be changed to first etch layer 30, to be consistent with Fig 12. Appropriate corrections are required.

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claims 4 & 12 recites "at least one column " and "the column being disposed between the substrate and the support layer" (claim 4) and "between the first intermediate dielectric layer and the support layer" (claim 12), which are not described in the specification.

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "at least one column" claimed in claim 4 & 12 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 6-7, 9-10, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Seko et al. (US 6075315, hereinafter Seko).

Regarding claim 1, Seko discloses an apparatus for emitting electrons (field emission cold cathode, Fig 1, Fig 3C), comprising, a substrate (1) having an emission side, a plurality of emitter tips (lines 25-30 of column 1) protruding from the emission side of the substrate (5 of Fig 1), a selected portion of a first dielectric layer (2) contacting the emission side of the substrate between the emitter tips (5), each emitter tip being contiguous with an opening in the first dielectric layer, a dielectric support layer (3) contacting the selected portion of the first dielectric layer (2), the opening in the first dielectric layer being contiguous with an opening in the dielectric support layer (3, lines 1-31 of column 6), the opening in the dielectric support layer (3) having a size ( $D_i$  of Fig 3A-3C), and a gate layer (4) contacting the dielectric support layer (3), the opening in the dielectric support layer being contiguous with an opening ( $D_g$ ) in the gate layer, the opening in the gate layer having a size, wherein the size of the opening in the gate layer ( $D_g$ ) is equal to or greater than the size of the opening in the dielectric support layer ( $D_i$ , see Fig 3A-3C, lines 10-15 of column 7).

Regarding claim 2, Seko discloses that the first dielectric layer is composed of silicon dioxide and the dielectric support layer is composed of silicon nitride (lines 36-38 of column 6).

Regarding claim 6, Seko discloses a cover layer (insulating layer 81 of Fig 14A) in contact with the gate layer 4 (lines 15-17 of column 11).

Regarding claim 7, Seko discloses an apparatus for emitting electrons (field emission cold cathode, Fig 7) comprising a substrate (1) having an emission side, a plurality of emitter tips (5, lines 25-30 of column 1) protruding from the emission side of the substrate, a selected portion of a first etch layer (11) contacting the emission side of the substrate between the plurality of emitter tips, each emitter tip being contiguous with an opening in the first etch layer (11), a first intermediate dielectric layer (12) contacting the selected portion of the first etch layer, the opening in the first etch layer (11) being contiguous with an opening in the first intermediate dielectric layer (12), a selected portion of a second intermediate dielectric layer (13-15) contacting the first intermediate dielectric layer (12), the opening in the first intermediate dielectric support layer being contiguous with an opening in the second intermediate dielectric layer, a dielectric support layer (16, of Fig 6A) contacting the selected portion of the second intermediate dielectric layer (13-15), the opening in the second intermediate dielectric layer being contiguous with an opening in the dielectric support layer (16), the opening in the dielectric support layer having a size, a gate layer (4) contacting the dielectric support layer (16), the opening in the dielectric support layer being contiguous with an opening in the gate layer, the opening in the gate layer having a size, wherein the size of the opening in the gate layer is as large or larger than the opening in the dielectric support

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layer (see Fig 7).

Regarding claim 9, Seko discloses that the first intermediate dielectric layer (12) is composed of silicon nitride (lines 5-7 of column 9).

Regarding claim 10, Seko discloses that the support layer is composed of silicon nitride (lines 7-10 of column 9).

Regarding claim 13, Seko discloses a cover dielectric layer (81 of Fig 11A) contacting the gate layer (4, lines 15-17 of column 11).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 5 and 14, are rejected under 35 U.S.C. 103(a) as being unpatentable over Seko et al. as applied to claim 1 above, and further in view of Tjaden et al. (US5804910).

Regarding claims 5 and 14 Seko teaches all the limitations of claim 5 & 14 except for the limitation of emitter tip is carbon based.

However, Tjaden et al. discloses a field emission cathode (13 of Fig 1) which is carbon-based. Tjaden et al. further disclose that carbon based emitter tips provide major advantage of hardness as well as stability of the emitter (see lines 66 of column 3-lines 8 of column 4).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a carbon based emitter in the device of Seko, since carbon based field emitters are durable and stable and also have low work function.

Claims 3-4 & 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seko et al. as applied to claim 1 above, and further in view of Levine et al. (US 5589728).

Regarding claims 3-4 & 11-12, Seko discloses all the limitations of claims 3-4 & 11-12, except for each cavity surrounding a group of emitters, instead Seko discloses a single emitter in each cavity and at least a column being disposed between substrate and the support layer.

However, Levine discloses a group of emitters (14 of Fig 11F) provided in a cavity (141) and a column (post 143 of Fig 11F, lines 65 of column 6- line18 of column 7) in order to reduce the cathode to gate capacitance by reducing dielectric material between cathode and grid (lines 34-48 of column 3).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a group of field emitter tips in a cavity as



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disclosed by Levine in the device of Seko et al. in order to have reduced gate to cathode capacitance.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Seko et al. as applied to claim 1 above, in view of Gray et al. (US 4964946).

Regarding claim 8, Seko discloses all the limitations of claim 8, except for the first etch layer (11) being comprised of aluminum. Instead, Seko discloses insulating silicon dioxide layer.

However, Gray et al. discloses a process of fabricating field emitter arrays where a first etching layer 12 is a metal layer (see Fig 16), in order to protect emitter tip from subsequent etching.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a metal such as aluminum (since aluminum is a suitable etch material), in the device of Seko, in order to protect the emitter tips.

#### ***Other Prior Art Cited***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure : Moradi et al. (US 6509686); Jones et al. (US 5534743).

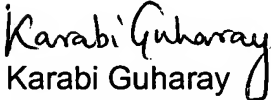
#### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karabi Guharay whose telephone number is (571) 272-2452. The examiner can normally be reached on Monday-Friday 8:30 am - 5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Karabi Guharay  
Patent Examiner  
Art Unit 2879